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## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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# **FACSIMILE COVER SHEET**

X FACSIMILE COVER SHEET NEW APPLICATION DECLARATION (# Pages) ASSIGNMENT (# Pages) FORMAL DRAWINGS INFORMAL DRAWINGS CONTINUATION APP'N (# Pages) DIVISIONAL APP'N		AMENDMENT (# Pages)  EOT (# Month)  NOTICE OF APPEAL  APPEAL (# Pages)  ISSUE FEE (# Pages)  CHANGE IN CORRESPONENCE  ADDRESS  X CERTIFICATE OF CORRECTION	
NAME OF INVENTOR(S): Koe  TITLE OF INVENTION: METHOD AND CIRCUIT FOR REDUCING QUANTIZER INPUT/OUTPUT SWING IN A		Serial No.: 10/766,233 Patent No.: 6,940,438 Filing Date: 1/28/2004	
SIGMA-DELTA MODULA	TOR T DEPOSIT ACCT, NO.:	·	
TI-36585	20-0668		
FAXED: 09/09/2005 DUE: ATTY/SECY: WDS/III:			

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## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

SEP 09 2005

Applicant:

Koe, et al.

10/766,233

Serial No.: Filing Date: 1/28/2004

Patent No.: 6,940,438

Art Unit: 2819

Examiner: Mai, Lam T.

Docket No.: TI-36585

Issue Date: 9/6/2005

Title: METHOD AND CIRCUIT FOR REDUCING QUANTIZER INPUT/OUTPUT SWING IN A

SIGMA-DELTA MODULATOR

# LETTER OF TRANSMITTAL

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**Patents** 

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CERTIFICATION OF FACSIMILE TRANSMISSION

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Enclosed is a Certificate of Correction for U.S. Patent No. 6,578,123.

Applicants believe that the error is the responsibility of the United States Patent and Trademark Office, therefore do fees are due at this time.

Respectfully submitted.

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# UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

PATENT NO:

6,940,438

DATED:

09/06/2005

INVENTOR(S):

Wern Ming Koe, Franco Maloberti, and James Robert Hochschild

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Inventors: Wern Ming Koe, Dallas, TX (US)

Franco Maloberti, Plano, TX (US

James Robert Hochschild, Plano, TX (US)

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W. Daniel Swayze, Jr. TEXAS INSTRUMENTS INCORPORATED PO Box 655474, WS 3999 Dallas, TX 75265

PATENT NO. 6,940,438

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# (12) United States Patent Koe et al.

(10) Patent No.: US 6,940,438 B2 (45) Date of Patent: Sep. 6, 2005

(54)	METHOD AND CIRCUIT FOR REDUCING
	QUANTIZER INPUT/OUTPUT SWING IN A
	SIGMA-DELTA MODULATOR

(75) Inventors: West Ming Koe, Dallas, TX (US);
Franco Maloberti, Plano, TX (US);
James Robert Hochschild, Plano, TX (US)

(73) Assignee: Texas Instruments Incorporated, Dallas, TX (US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 10/766,233

(22) Filed: Jan. 28, 2004

(65) **Prior Publication Data**US 2005/0162296 A1 Jul. 28, 2005

341/156, 155, 176, 131

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### (57) ABSTRACT

Disclosed is a circuit and method for reducing output swing in a sigma delta modulator. The quantizer output swing reduction circuit and method of the present invention advantageously enables the modulator to have a larger input/output swing range without degrading the SNR and SFDR performance. One embodiment of the present invention comprises a conventional sigma-delta modulation circuit (100) and a quantizer swing reduction block (210). The quantizer swing reduction block (210) comprises an input signal Vx (216), a signal processing block (214) with transfer function H3 and another signal processing block (215) with transfer function H2\*H3.

## 32 Claims, 11 Drawing Sheets

